George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

ED27-SHK-FOP-010
BASELINE
11/18/99

ED27 / VIBRATION, ACOUSTICS, AND SHOCK TEAM

FACILITY OPERATING PROCEDURE

CONFINED DETONATNG FUSE (CDF) ASSEMBLY KEY REMOVAL

This Procedure Describes
Safety Critical Operations

CHECK THE MASTER LIST—
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Signature sheet is on file per ED27-OWI-M&V-001.

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APPROVED BY:	Original signed by Terry J. Hamm Terry Hamm/QS10 SR&QA Department	11-4-99 Date

Document History Log

Status (Baseline / Revision / Canceled)	Document Revision	Document Date	Description
Baseline		11/18/99	Document converted from ED73-SHK-FOP-010 Baseline. Entire procedure updated. Organizational and document number changes were also incorporated.

1.0 INTRODUCTION

1.1 Purpose

CDF assemblies are keyed (reference designators) for flight use to facilitate proper connections. When the assemblies are used in testing, keys must often be removed in order to connect them to other hardware. This procedure contains detailed steps necessary to remove the alignment keys from a CDF assembly in the Pyrotechnic Shock Facility in building 4619.

The Pyrotechnic Shock Facility is located in Rooms 170, 170A and 170B of Building 4619. Room 170A is designated as the Control Room. All CDF assembly key removal activities will be in Room 170.

PYROTECHNIC SHOCK FACILITY

BUILDING 4619

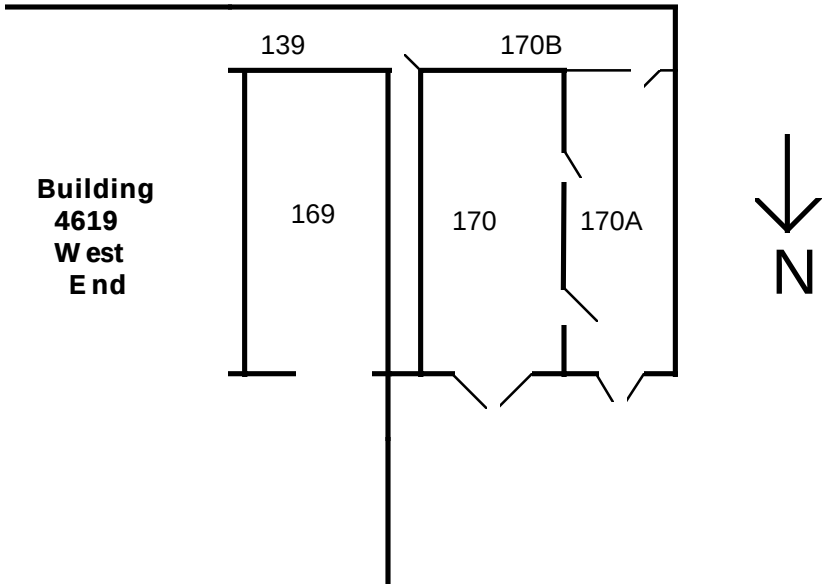


FIGURE 1

1.2 Scope

This document contains the steps to prepare the facility, remove the key, and follow in the event of an accidental detonation.

2.0 SAFETY

2.1 Emergency Telephone Numbers

MSFC Medical Center	4-2390
Ambulance	911
Fire	911
Security	4-4357
Safety	4-0046

See Section 6.0 for emergency procedures.

2.2 PYROTECHNIC RELATED SAFETY REQUIREMENTS

Once the CDF assembly has been moved to Room 170 of Building 4619, strict access control requirements will be initiated for that area. These requirements are briefly outlined as follows:

2.2.1 No personnel will be allowed in hazardous areas (Rooms 170, 170A, and 170B of building 4619) without the specific authorization of the ED27 Test Engineer.

2.2.2 Eye protection and hearing protection will be utilized by all personnel entering an area containing unstored pyrotechnic devices.

2.2.3 During CDF assembly key removal operations, all unnecessary personnel will be evacuated from the hazardous area.

2.2.4 The CDF assembly is not susceptible to RF or static discharge.

2.2.5 Care should be taken to prevent excessive heat buildup in the CDF assembly.

3.0 REFERENCE DOCUMENTS

ED27-SHK-SOP-001 Pyrotechnic Shock Facility

4.0 GENERAL REQUIREMENTS

4.1 The Test Engineer will be in charge of all preparations and activities.

4.2 All activities will be coordinated with the Test Engineer.

4.4 All changes to the procedure will be coordinated with the Test Engineer and the SR&QA Department.

4.5 The Test Engineer will assure that operations involving explosives are restricted to certified personnel in accordance with ED27-OWI-006.

5.0 OPERATIONAL PROCEDURE

5.1 All unnecessary personnel will be evacuated from the hazardous area.

5.2 Turn on outside red warning light.

5.3 Personnel handling the CDF assembly will be wearing hearing and eye protection as well as leather gloves.

5.4 Place the CDF Assembly Key Removal Fixture at the north end of room 170 with the open tube end pointed toward the far end of the room.

5.5 Remove one CDF assembly from the temporary storage in Room 170B of Building 4619 and transport to Room 170.

5.6 Examine the CDF assembly for damage.

5.7 Place the end of the CDF assembly not being modified into the lower left hand CDF tip holder of the Key Removal Fixture and hand tighten the tip end connector nut.

5.8 Move the tip end connector nut behind the backshell. Carefully clamp the end tip to be modified into the right side of the fixture. The clamp should only contact the metallic section of the end tip between the shoulder and the crimped area of the backshell. See Figure 2 for a graphic description of a CDF assembly.

5.9 Carefully adjust the Key Removal Fixture until the end tip of the CDF assembly has been inserted into the tube 1/2 of an inch.

5.10 The key should be removed with slow deliberate strokes of a standard metal file. Care should be taken not to generate heat that is detectable by touch. Do not remove metal below flush with the end tip barrel during the filing operation.

Note: Complete removal of the key may not be required. Terminate the operation when the CDF end tip can be completely inserted into the mating part.

5.11 After the key has been sufficiently modified, remove the end tip and inspect the CDF assembly for damage. Go to step 5.7 and repeat this procedure if both end tips require modifying. Otherwise, repackage the CDF assembly in the original storage material.

5.12 Return the CDF assembly back to the temporary storage in Room 170B of Building 4619.

5.13 If there are no more CDF assemblies to be modified, remove personal protection devices and turn off the outside red warning light.

6.0 EMERGENCY PROCEDURES

6.1 During transporting and key removal of CDF Assembly

Personnel will immediately stop operations and evacuate the hazardous area when:

a. A fire exists in the immediate vicinity.

b. A tornado or severe weather is reported in the vicinity.

c. Loss of facility power or lights occurs in the test area.

6.2 After Accidental Ordnance Detonation

The following actions will be taken in the event of an accidental detonation of the CDF Assembly.

a. Evacuate any injured and all other personnel from the area.

b. Provide emergency first aid as needed.

c. Call ambulance and/or fire department (911) if required.

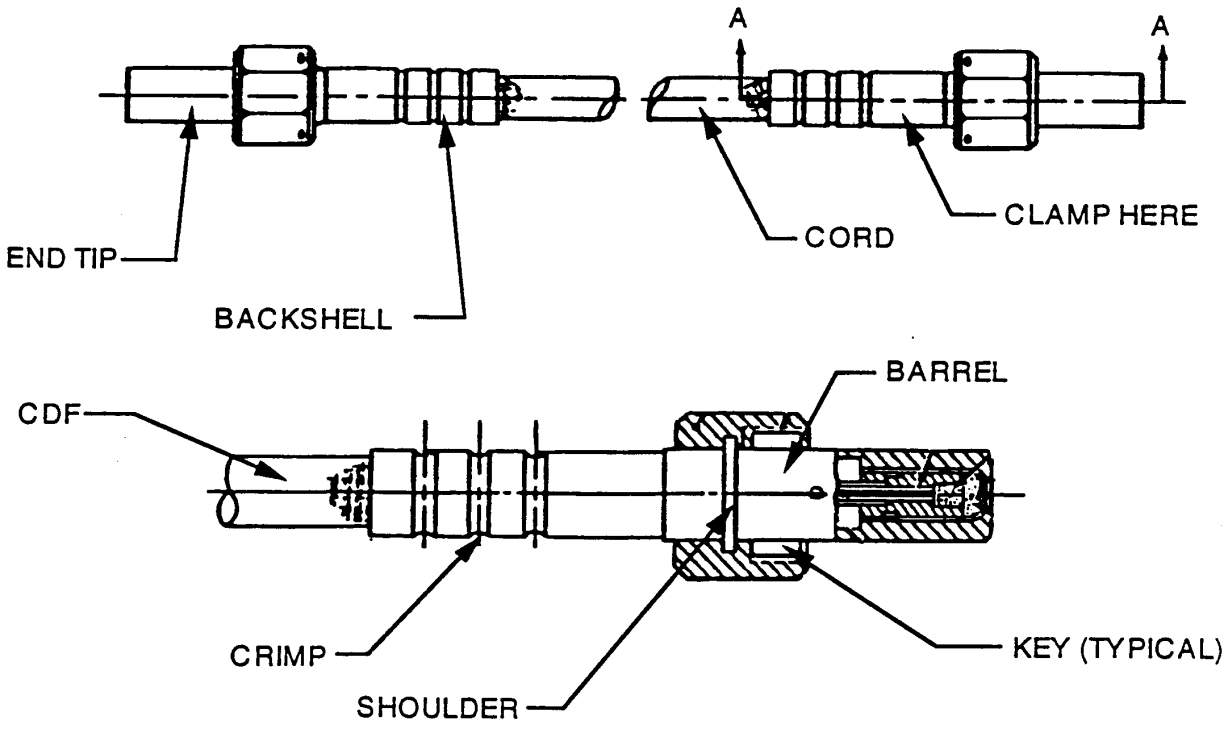
d. Notify the ED27 Test Engineer and Safety (4-0046).

7.0 APPENDICES

APPENDIX A Data Sheets

APPENDIX B CDF Assembly Key Removal Fixture Drawings

CONFINED DETONATING FUSE (CDF) ASSEMBLY



SECTION A - A

FIGURE 2

APPENDIX A

DATA SHEETS

6.5 CDF Assembly. The CDF assembly is an explosive device which provides a means of detonation propagation between ordnance devices. It is the basic explosive transfer assembly used in the SRB and ET ordnance systems. A total of 35 assemblies are used on each SRB and seven assemblies are used on the ET. The assembly consists of a mild detonating fuse, layers of material as the confining agent, identical end connectors and sleeves, and booster charges (See Figure 6-8). Each sleeve incorporates index keys to prevent connection of unrelated pyrotechnic systems. The purpose of the booster charge is to ensure detonation transfer to the mating device.

Reference designators are required on all SRB CDF assemblies. These reference designators aid in installing the CDF assemblies in the proper locations. Table 6-2 and Figure 6-9 define the SRB CDF assembly requirements and associated reference designators. Table 6-3 defines the ET CDF assembly requirements.

6.5.1 Characteristics

6.5.1.1 Configuration and Dimensions. See Figure 6-8 and Tables 6-2 and 6-3.

6.5.1.2 Output. The output of the CDF assembly is equivalent to an X-349 end primer.

6.5.1.3 Detonation Sensitivity. The CDF assembly base charge has a sensitivity to detonation from an external source equivalent to the output of a 10SPC-0036 CDF manifold.

6.5.1.4 ICC Classification. Class C.

6.5.1.5 Operating Temperature

a. SRB: -319° F for 12 hours to +250° F for 30 minutes after stabilization at +195° F.

b. ET: -319° F for 12 hours to +250° F for 30 minutes applied to the end tips and +350° F for 30 minutes applied to the cord.

6.5.1.6 Nonoperating Temperature. +20° F to +140° F for 60 days.

6.5.1.7 Auto Ignition Temperature. Greater than +275° F.

6.5.1.8 Impact. The CDF assembly will withstand, without detonating, the impact of a 10 pound steel weight with a 0.5 inch radius by two inches long striking face dropped from a height of 16 foot.

UNITED TECHNOLOGIES USBI

DOCUMENT NO.: 10MNL-0030
DATE.: March 17, 1989

6.5.2.1.11 Adhesives

a. EA 934

b. RTV-511

c. MERECO

6.5.2.1.12 Molding Powder. Hysol MG 5F, WS12389.

6.5.2.2 Ensign Bickford CDF Assembly

6.5.2.2.1 Sleeve. CRES 304L Cond. A per QQ-S-763.

6.5.2.2.2 Nut. CRES 302 or 304 Cond. A per QQ-S-763.

6.5.2.2.3 Booster Shell. CRES 302 Cond. A per QQ-S-766.

6.5.2.2.4 Base Charge. Superfine PETN (.8 grains) per MIL-P-387 loading pressure 488 to 512 psi. (See paragraph 7.1 for characteristics of PETN.)

6.5.2.2.5 Carrier Charge. Superfine PETN (.3 grains) per MIL-P-387 loading pressure 1090 to 1190 psi. (See paragraph 7.1 for characteristics of PETN.)

6.5.2.2.6 Ferrule. CRES 302 or 304 per QQ-S-763.

6.5.2.2.7 MDF. Lead Sheath with 2.0 gpf PETN per MIL-P-387. (See paragraph 7.1 for characteristics of PETN.)

6.5.2.2.8 Confining Braid. Yarn-glass per MIL-Y-1140 and polyethene plastic jacket per L-P-390.

6.5.2.2.9 End Seal. 1201CN611 Epoxy.

6.5.3 Specification Number. 10SPC-0035.

6.5.4 Flight Part Numbers. See Tables 6-2 and 6-3.

6.5.5 Qualification Status and Report. See Volume II, paragraph 8.7.

6.5.6 Manufacturers.

6.5.6.1 SRB CDF Assembly. Ensign Bickford (10314-0001-8XX) and Teledyne McCormick-Selph (10315-0001-8XX).

6.5.6.2 ET CDF Assembly. Teledyne McCormick-Selph (10315-0001-8XX).

UNITED TECHNOLOGIES
USBI Booster Production Company, Inc.

DOCUMENT NO: 10MNL-0030
DATE:

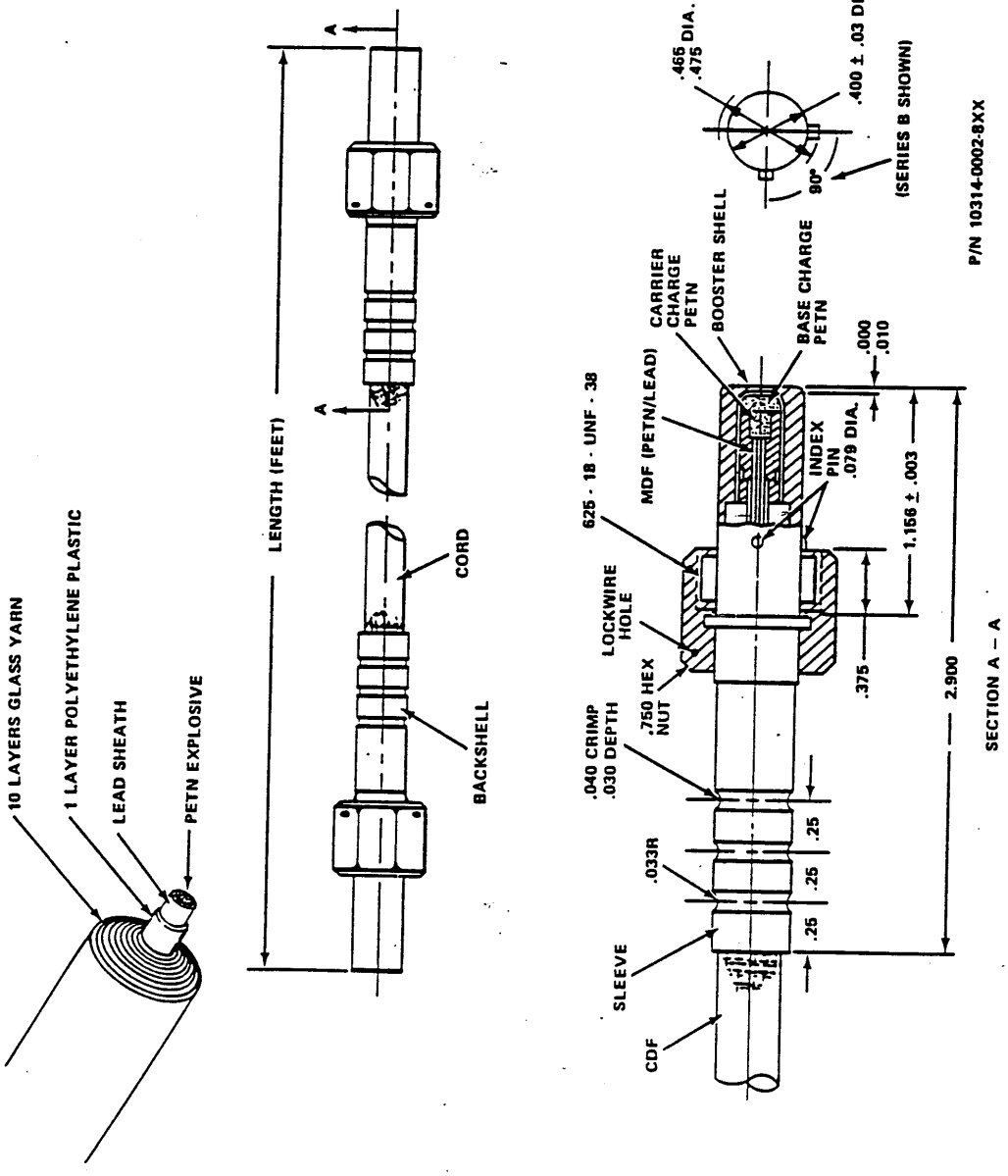


FIGURE 6-8 CDF ASSEMBLY - ENSIGN BICKFORD (SHEET 1 OF 2)

BPC 5048A 185-101

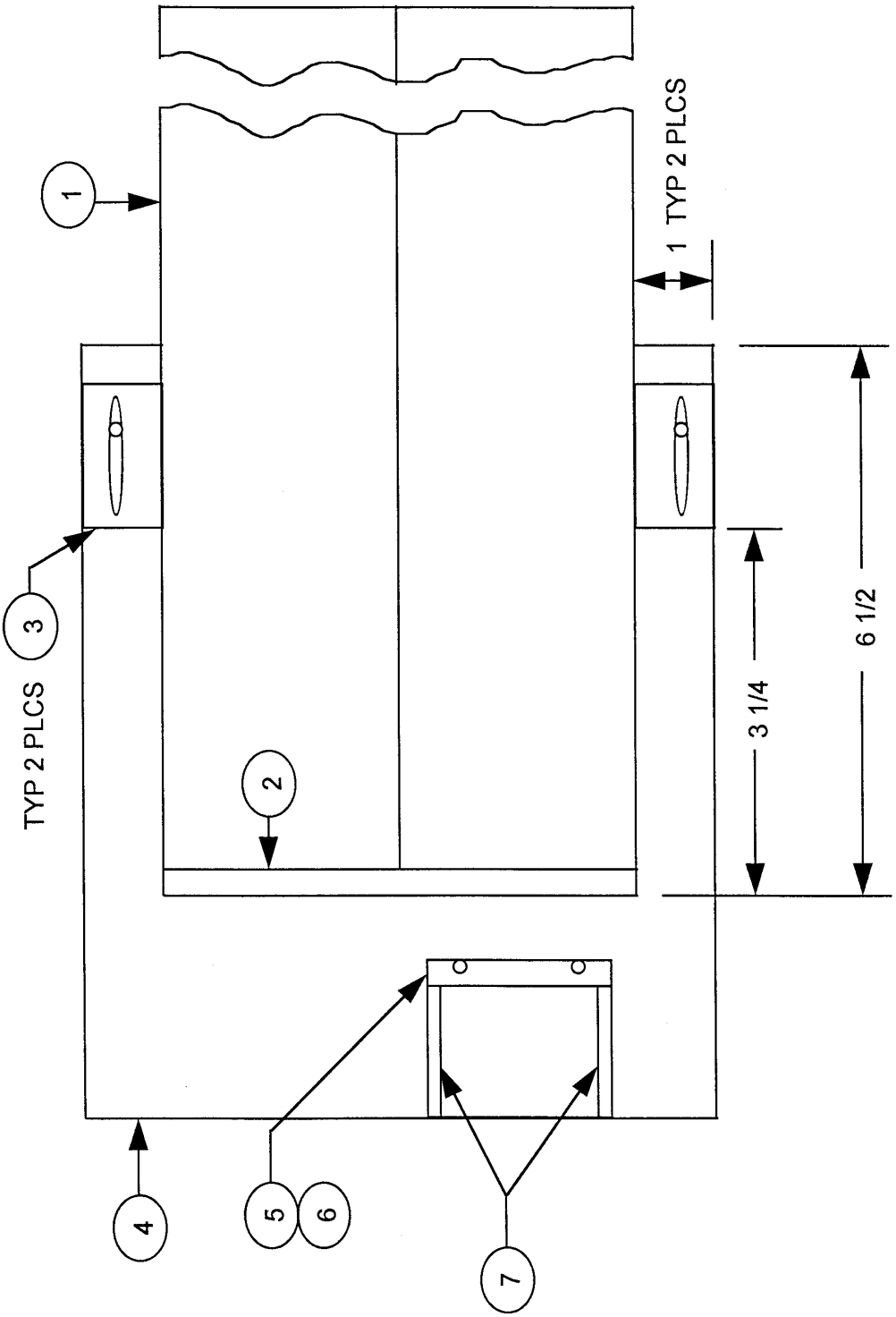
CDF ASSY

APPENDIX B

CDF ASSEMBLY KEY REMOVAL

FIXTURE DRAWINGS

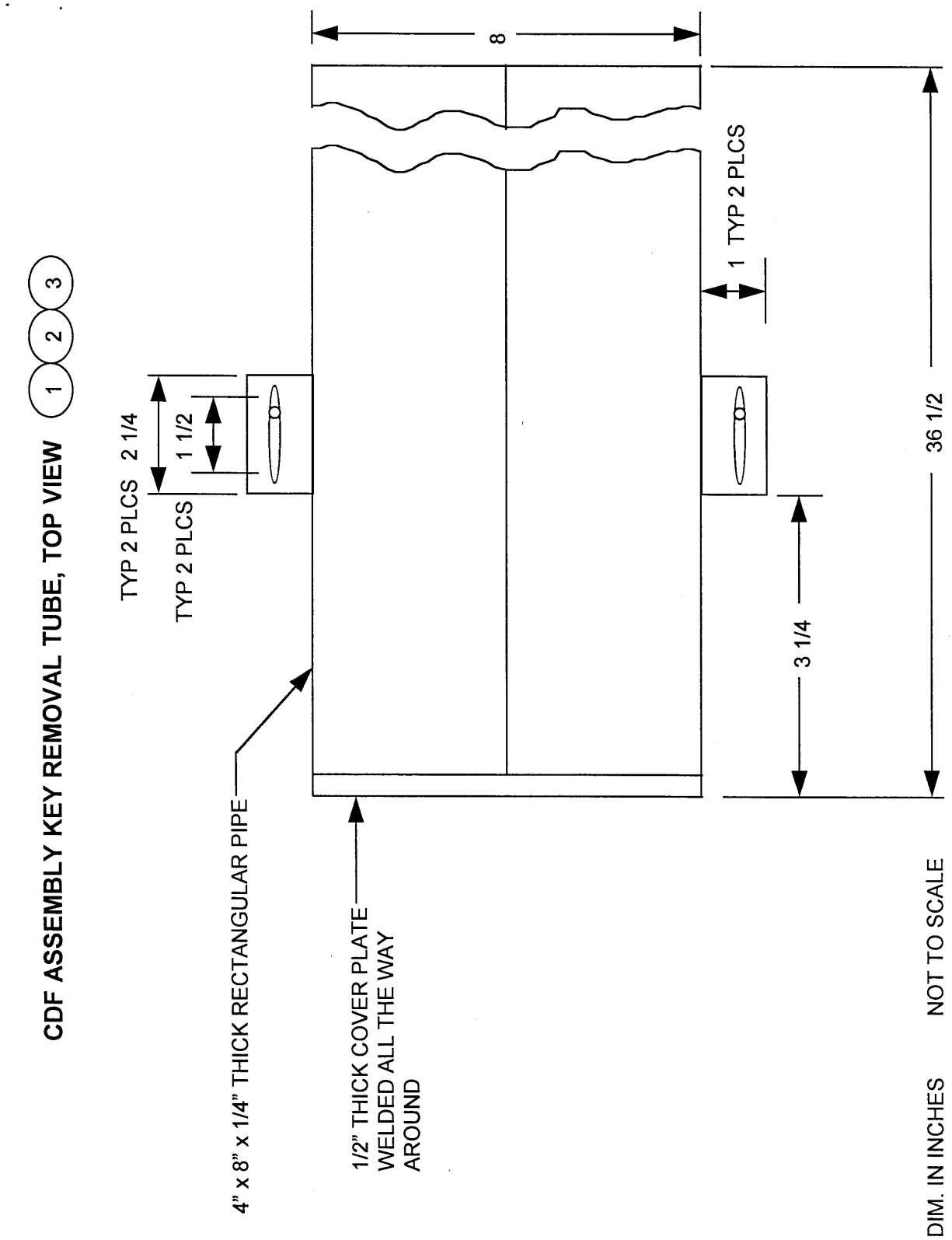
CDF ASSEMBLY KEY REMOVAL FIXTURE ASSEMBLY

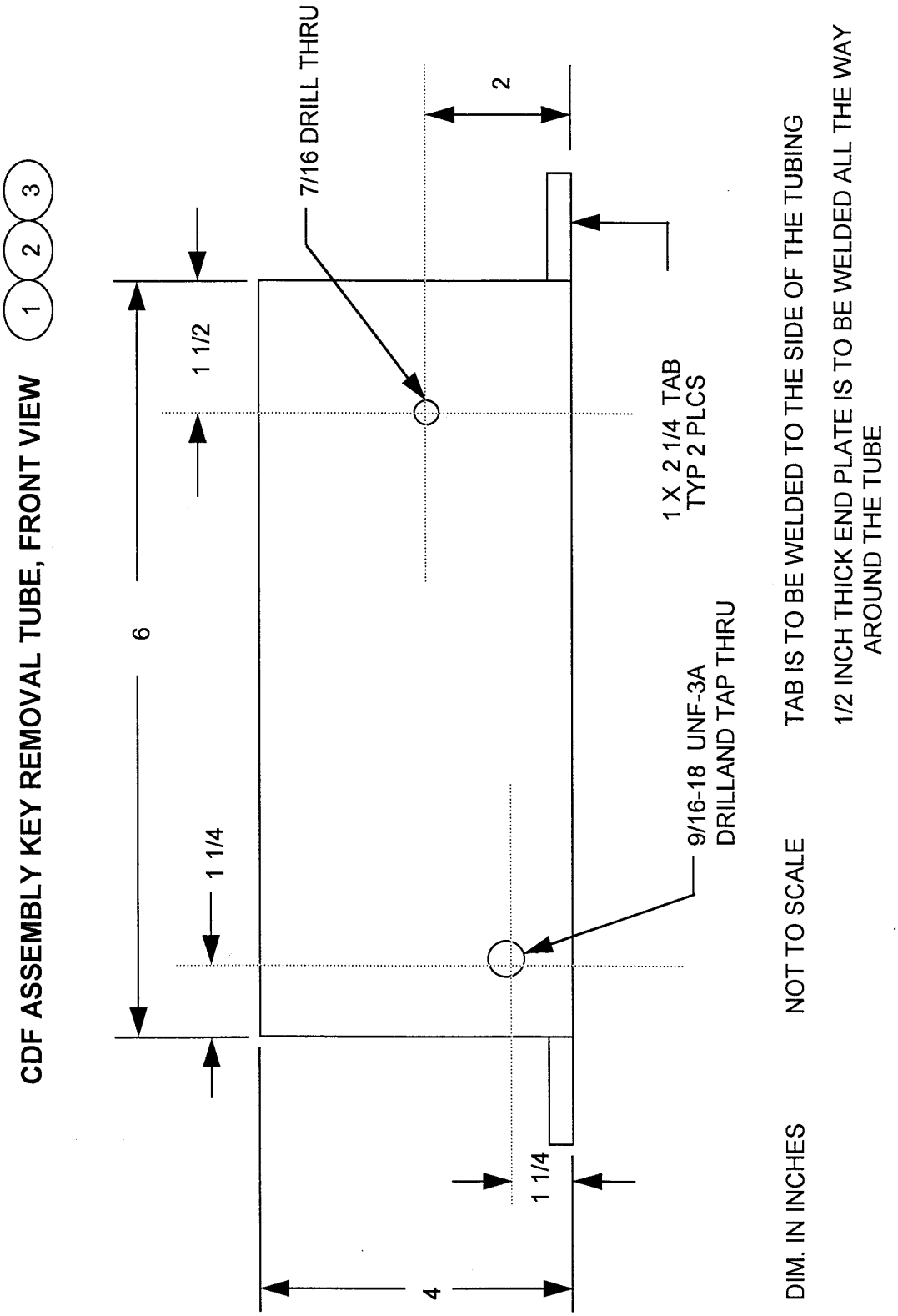


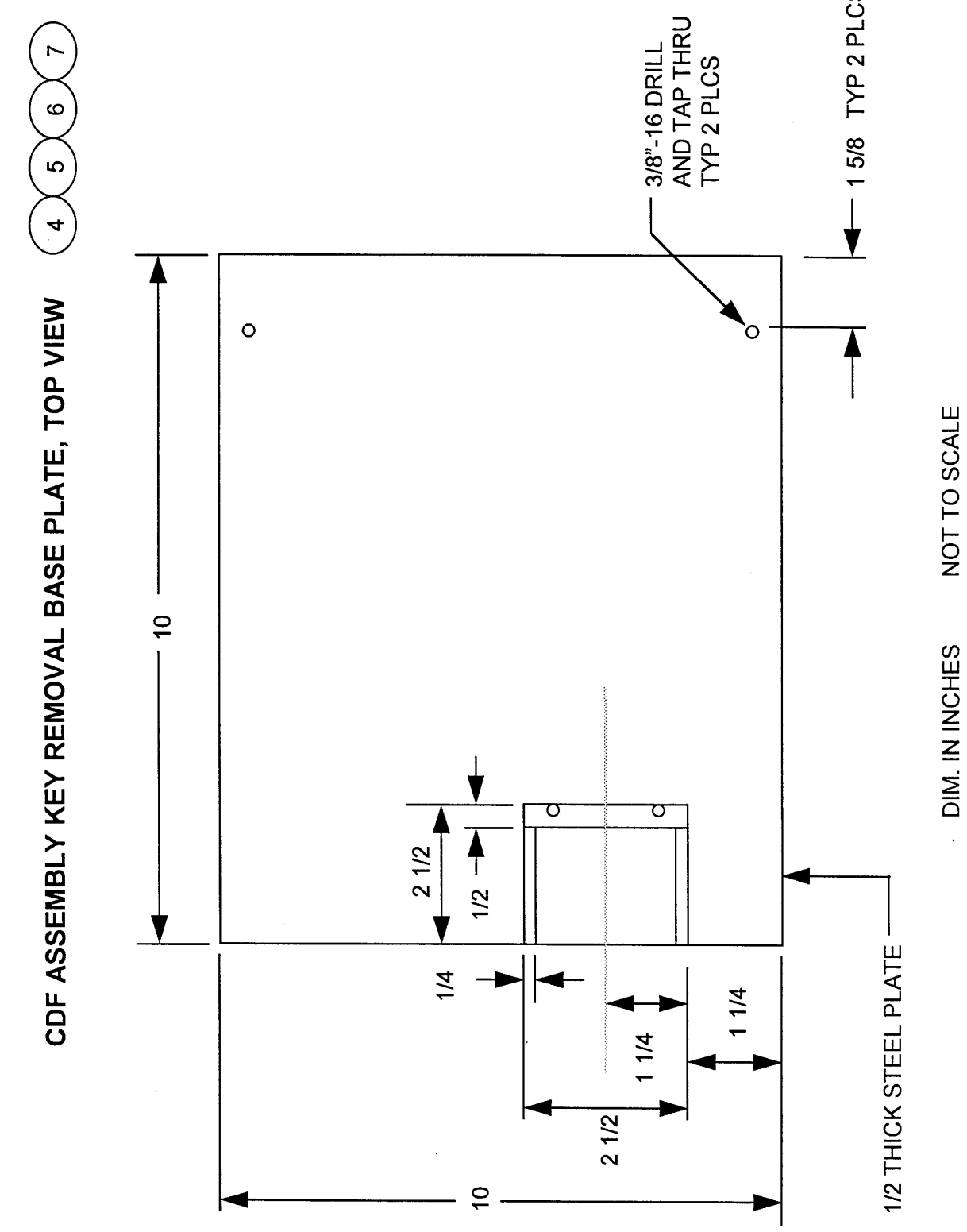
DIM. IN INCHES NOT TO SCALE

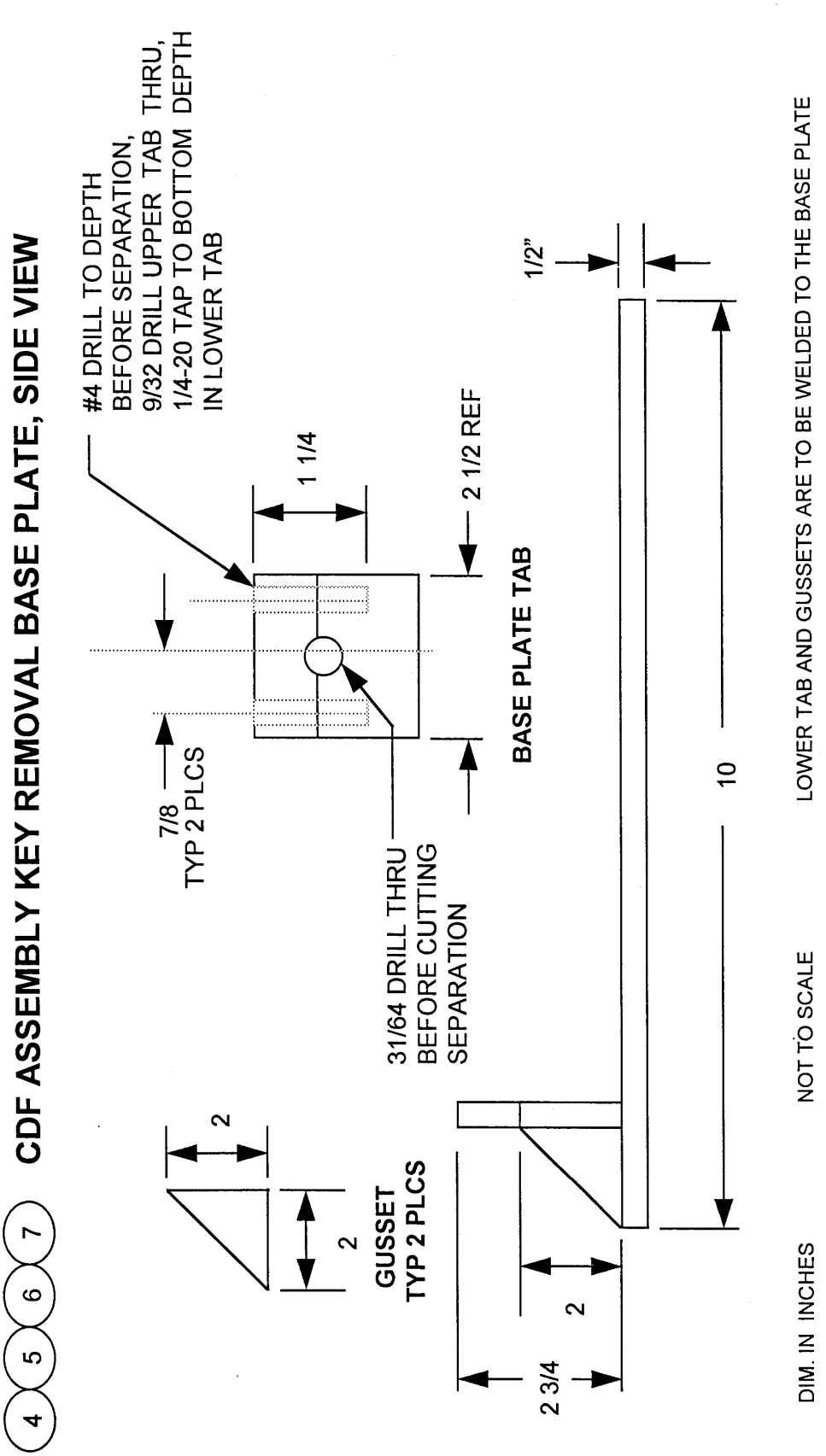
CDF ASSEMBLY KEY REMOVAL FIXTURE PARTS LIST

Detail	Qty.	Size	Description
1	2	4" x 4" x 36"	long square pipe
2	1	4" x 8" x 1/2"	steel plate
3	2	1" x 2 1/4" x 1/2"	steel tab
4	1	10" x 10" x 1/2"	steel plate
5	1	2 1/2" x 2" x 1/2"	steel plate
6	1	2 1/2" x 3/4" x 1/2"	steel plate
7	2	2" x 2" x 1/2"	triangular steel plate
	2	3/8" x 16 3/4" long	bolt
	2	1/4" x 20 1" long	bolt


CDF ASSEMBLY KEY REMOVAL TUBE, TOP VIEW
1 2 3
8
1 TYP 2 PLCS
TYP 2 PLCS 2 1/4
1 1/2
TYP 2 PLCS
36 1/2
3 1/4
4" x 8" x 1/4" THICK RECTANGULAR PIPE
1/2" THICK COVER PLATE WELDED ALL THE WAY AROUND
DIM. IN INCHES NOT TO SCALE


CDF ASSEMBLY KEY REMOVAL TUBE, FRONT VIEW
1 2 3
7/16 DRILL THRU
2
1 1/2
6
1 1/4
1 X 2 1/4 TAB
TYP 2 PLCS
9/16-18 UNF-3A
DRILLAND TAP THRU
1 1/4
4
DIM. IN INCHES
NOT TO SCALE
TAB IS TO BE WELDED TO THE SIDE OF THE TUBING
1/2 INCH THICK END PLATE IS TO BE WELDED ALL THE WAY AROUND THE TUBE


CDF ASSEMBLY KEY REMOVAL BASE PLATE, TOP VIEW
4 5 6 7
3/8"-16 DRILL AND TAP THRU TYP 2 PLCS
1 5/8 TYP 2 PLCS
10
2 1/2
1/2
1/4
1 1/4
1 1/4
2 1/2
10
1/2 THICK STEEL PLATE
DIM. IN INCHES
NOT TO SCALE


4 5 6 7
CDF ASSEMBLY KEY REMOVAL BASE PLATE, SIDE VIEW
#4 DRILL TO DEPTH BEFORE SEPARATION, 9/32 DRILL UPPER TAB THRU, 1/4-20 TAP TO BOTTOM DEPTH IN LOWER TAB
1 1/4
2 1/2 REF
7/8 TYP 2 PLCS
31/64 DRILL THRU BEFORE CUTTING SEPARATION
BASE PLATE TAB
1/2"
10
2
2
GUSSET TYP 2 PLCS
2 3/4
DIM. IN INCHES
NOT TO SCALE
LOWER TAB AND GUSSETS ARE TO BE WELDED TO THE BASE PLATE